

Chapter 9

Artificial Intelligence in the Detection of Alzheimer's Disease

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ABSTRACT

Dementia is a neurological illness that causes diversion from a variety of important cognitive activities. Common examples include memory, reasoning, orientation, understanding, computation, verbal communication, and decision making. Alzheimer's disease (AD) is one of the most common dementias affecting the elderly. It was projected that more than 47 million people globally will be affected by dementia in 2015; these predictions were verified, and forecasts for 2050 are much more concerning, with 131 million people living with dementia. The basic objective of AI is to improve human decision-making and automate operations that are too time-consuming or resource-intensive for people to accomplish. AI can operate as a fast, accurate, and in the long run, cost-effective method to assist human experience and intuition through predictive analytics. AI is an effective technique for AD detection as these methods are employed as a computer-aided diagnosis (CAD) system in clinical practices and play a crucial role in identifying variations in the brain images to detect AD.

INTRODUCTION

Memory suffers from poor function at times because of distraction, information overload, or mild melancholy. Unless anything goes wrong, we maintain a vast store of general knowledge, the capacity to organise and control our affairs, and our orientation in time and location. Attention, memory, executive cognitive function, language, and visuospatial ability are examples of the distinct cognitive domains that

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define cognitive talents. The brain's ability to retain and retrieve memories across decades is one of its many notable abilities. Forgetting happens just as regularly as learning in our daily lives. The amnesia condition occurs after a severe traumatic brain injury or illness, with brain damage having severe memory problems and the inability to learn.

Dementia has its roots in Latin *de* and *men's* (translated, respectively, as *out of* and *mind*). Ageing brings a lot of ills, and dementia tops the list of greatest fears. We have yet to decipher the complexities of the brain. Major Neurocognitive Disorder is a new term for dementia.

Dementia is a degenerative condition in which the patient's mental capacity consistently deteriorates progressively or chronically and worsens with time. It is a challenging condition that impairs many functions, including memory, concentration, understanding, computation, learning ability, language, and judgment. Being aware, or being conscious, is not altered. Because of emotional Control, social behaviour, and decreased motivation, most people who have a cognitive disability also experience behavioural problems.

Dementia happens when the brain is affected by Alzheimer's disease or stroke and other diseases and traumas. Of all dementia cases, 70% are linked to Alzheimer's. Being diagnosed with a mental illness is difficult for the patient and on the patient's family members and friends.

A degenerative brain illness was seen in humans; Alzheimer's disease (AD) is the most prevalent cause of dementia and has several possible triggers that might result in dementia. A person's capacity to do everyday tasks can be hindered by memory, language, and other cognitive skills. Cognitive capabilities can be compromised by decreased memory, speech, and different cognitive abilities. In general, the five A's of Alzheimer's disease are amnesia, aphasia, apraxia, agnosia and abnormal executive function. It's because nerve cells (neurons) in the brain's cognitive-function areas have been destroyed and are no longer operating as they should.

In 2015, the Alzheimer's Association study (Association, 2015) found that 5.3 million Americans had Alzheimer's. Even though almost 5.1 million people over 65 have Alzheimer's, about 200,000 people under 65 also have the condition. As people age, the rate of AD goes up dramatically. More than 40% of the elderly have AD by the time they reach 85 years of age, but the disease affects fewer than 5% of the general population when they become 65. The 2014 Alzheimer's Disease International Report (Alz.co.uk) gives the estimated number of individuals in the Asia Pacific regions who have dementia. For instance, it is projected that there will be 40.3 million people in India in 2015, but by 2030, that number will be much higher, at 67.4 million. Those with dementia in the Asia Pacific area are expected to swell from 13.7 million in 2005 to 64.6 million by 2050 (PACIFIC, 2006) In approximately 50 - 60 years, the US population has grown by 34 million, and life expectancy has increased by nine years. Over 6 million Americans now have Alzheimer's disease, and without early diagnosis or a cure, this figure might rise to nearly 14 million by 2050.

BACKGROUND

The aberrant accumulation of proteins within and around brain cells is suspected to be the origin of Alzheimer's disease. A protein known as amyloid, which forms plaques around brain cells, is significant. Brain cells are tangled with the presence of a protein called tau. Scientists have discovered that this process begins years before symptoms ever arise. However, they do not know the specific mechanism that triggers it. Neurons become weakened, causing chemical messengers neurotransmitters, which are used

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